Two new monotypic genera of Queensland millipedes (Diplopoda: Polydesmida: Paradoxosomatidae)

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Citation: Mesibov, R. 2013 10 10: Two new monotypic genera of Queensland millipedes (Diplopoda: Polydesmida: Paradoxosomatidae). *Memoirs of the Queensland Museum–Nature* 58: 7–13. Brisbane. ISSN 0079-8835. Accepted: 5 April 2013.

ABSTRACT

Eungellosoma gen. nov. is erected for *E. leichhardti* sp. nov. and *Binarcifer* gen. nov. for *B. superbus* sp. nov. Both new species have a gonopod telopodite deeply divided into branches and are here placed in Australiosomatinae: Australiosomatini. ❐ *Diplopoda, Polydesmida, Paradoxosomatidae, Queensland, Australia.*

Queensland has a diverse fauna of paradoxosomatid millipedes, with 31 described and at least 200 undescribed species (Mesibov, 2008). In 2006-07, the undescribed species known to date were sorted into coded taxa (e.g. genus QA, species QA1) by the author and Catherine Car. Among these undescribed species are Australiosomatini with the gonopod acropodite deeply divided into branches and obvious (although reduced) paranota. Some of the new species clearly belong in genera already known from Queensland: *Cladethosoma* Chamberlin, 1920, *Heterocladosoma* Jeekel, 1968, *Paraustraliosoma* Verhoeff, 1924, *Phyllocladosoma* Jeekel, 1968 and *Streptocladosoma* Jeekel, 1980. Other species just as clearly represent novel lineages, and in this paper I describe two particularly interesting Australiosomatini for which new generic names are needed. I suspect that both new genera will lose their monotypic status when Queensland's rich millipede fauna has been more thoroughly sampled.

MATERIALS AND METHODS

Specimens are stored in 75% ethanol in the Queensland Museum. Photomicrographs were taken with a Canon EOS 1000D digital SLR camera mounted on a Nikon SMZ800 binocular dissecting microscope equipped with a beam splitter. The photomicrographs in the figures are manually stacked composites, processed with Zerene Stacker 1.04 software. Measurements of dissected specimens were made with the same microscope using an eyepiece scale. Preliminary gonopod drawings on graph paper were made using an eyepiece grid at 160X on a binocular microscope. Collection data is given below as seen on specimen labels, with additional information in brackets; the latitude/longitude datum is WGS84. Abbreviations: Qld = Queensland; QM = Queensland Museum, Brisbane.

SYSTEMATICS

Order Polydesmida Pocock, 1887

Suborder Strongylosomatidea Brölemann, 1916

Family Paradoxosomatidae Daday, 1889

Subfamily Australiosomatinae Brölemann, 1916

Tribe Australiosomatini Brölemann, 1916

Eungellosoma gen. nov.

Type species. *Eungellosoma leichhardti* sp. nov., by present designation.

Etymology. For the Eungella district in Queensland, and *-soma* (from Greek 'body'), commonly used as a suffix in genus names for Paradoxosomatidae; neuter gender.

Diagnosis. Genus in Australiosomatinae: Australiosomatini with reduced but obvious paranota; gonopod acropodite divided at mid-length into four distally directed processes and a lateral tab; prostatic groove looping from anterior to posterior across base of tab before entering solenomere; central process laminate, cradling tip of solenomere, and with thin subprocess arising from distal margin of process curving medially and distally.

Remarks. *Eungellosoma leichhardti* sp. nov. shares a prostatic groove looping on a short tab with species in two other genera of Australiosomatinae: *Australodesmus* Chamberlin, 1920 and *Dicladosomella* Jeekel, 1982. In both genera the paranota are reduced but obvious, and Jeekel (1968) at first placed *Australodesmus* in Australiosomatini. He later decided it was more closely related to genera in Antichiropodini Brölemann, 1916 (Jeekel, 1979), but recognised that the indirect course of the groove made *Australodesmus* unique in that tribe. The tab is medial in *Australodesmus* and lateral in *Dicladosomella* and *Eungellosoma*, and in *Eungellosoma* the loop crosses the base of the tab, rather than the tip as in the other two genera. In general form, the *Eungellosoma* telopodite resembles that of *Gigantowales* Verhoeff, 1937 (Australiosomatini) in that the acropodite breaks up at mid-length into four distally directed processes, but the prostatic groove in *Gigantowales* runs more or less straight to the base of the solenomere, and there is no lateral tab.

Eungellosoma leichhardti sp. nov.
(Figs 1–3, 7, 8)

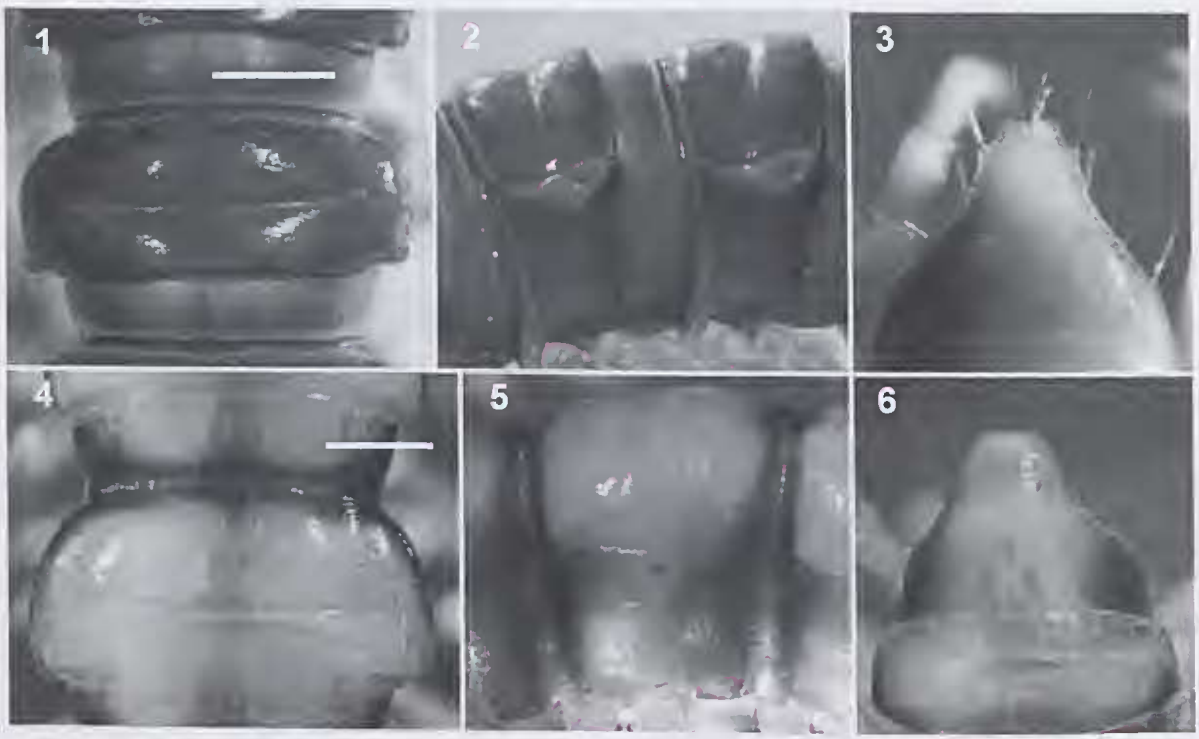
Etymology. For Ludwig Leichhardt (1813-?1848), naturalist and explorer; adjective.

Material Examinied. Holotype: Male, Dalrymple Road, Eungella National Park, Qld, 21°02′S 148°36′E, 29 July - 4 December 1992, R. Raven, P. and E. Lawless and M. Shaw, QM pitfall NQ39, rainforest, QM S74955; dissected. (Elevation ca 950 m a.s.l., estimated uncertainty ±1 km.)

Paratypes: 2 males, Upper Cattle Creek, Eungella, Qld, 21°02′S 148°36′E, 17 November 1992, G. Monteith, G. Thompson, D. Cook and H. Janetzki, QM S74954; dissected. (Location listed as 21°01′41″S 148°36′11″E in the QM Entomology database; ca 950 m a.s.l., estimated uncertainty ±500 m.)

Other material examined. None.

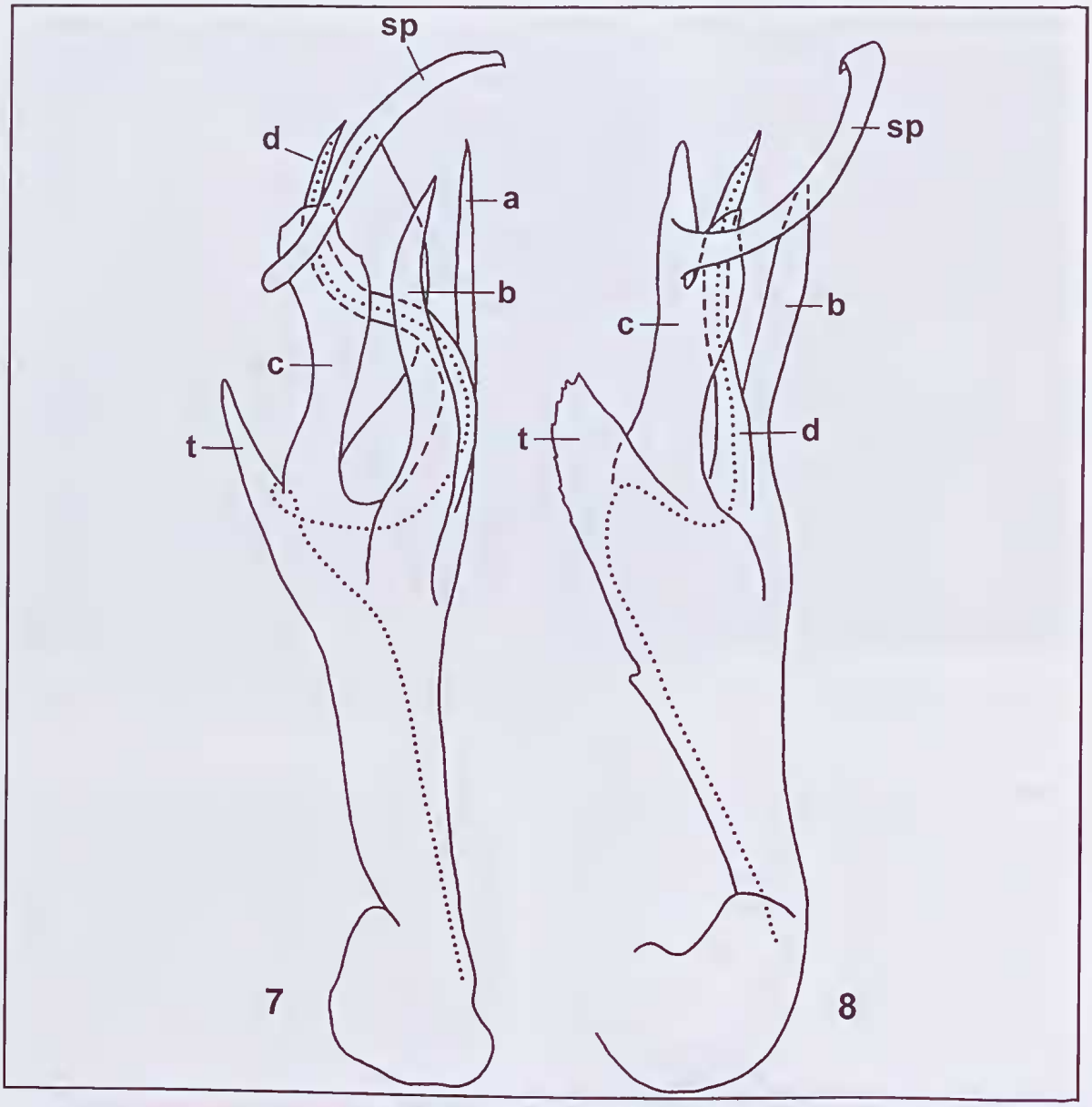
Description. *Somatic features.* Length ca 17 mm; midbody rings with maximum vertical diameter ca 1.5 mm, maximum width including paranota ca 1.7 mm. Colour of paratypes in alcohol medium reddish brown, darker anteriorly, with lighter paranota; legs, epiproct and antennal tips pale yellow. Holotype light brown above, fading to pale yellow beneath; anterior and posterior metatergal margins each marked with narrow, dark brown line. Head slightly narrower than collum; vertex and frons sparsely setose, clypeus lightly setose; vertigial sulcus clearly defined to level of top of antennal sockets; postantennal groove shallow; sockets separated by 1.0x socket diameter. Antenna reaching just past tergite 3 when stretched; antennomere 6 widest; relative antennomere lengths (2, 3, 6) >(4, 5). Collum in dorsal view with anterior margin nearly straight and posterior margin very slightly emarginate; smoothly rounded laterally with no trace of posterior angle. Relative ring widths 6 >5 >(4, collum) >(2, 3); ring widths 6-16 about equal. Diplosegments (Figs 1, 2) with pronounced waist, narrow zone anterior to metatergite with cellular structure, suture inconspicuous; metazonite smooth, prozonite with very faint polygonal microsculpture. Tergites with distinct transverse furrow, not extending laterally as far as paranota. A few setae in transverse row on metatergite, midway between transverse furrow and anterior metatergal margin. Pleural keels present as small but detectable bulges on rings 2–4. Lateral margin of ring 2 paranotum well below lateral collum margin and ring 3 paranotum; slightly upturned laterally with rectangular anterior corner. Distinct but much-reduced paranota on rings 3–17, in dorsal view (Fig. 1) very slightly convex laterally, not extending past posterior metatergal margin, with narrow, shallow dorsal sulcus; paranotum just above mid-height in lateral view (Fig. 2). Pore formula 5, 7, 9, 10, 12, 13, 15–19; ozopores



FIGS 1–6. *Eungellosoma leichhardti* sp. nov., paratype ex QM S74954 (**1–3**), *Binarcifer superbus* sp. nov., holotype, QM S75043 (**4–6**). Midbody rings in dorsal view (**1, 4**) and lateral view (**2, 5**), and dorsal views of epiproct (**3, 6**). Scale bars in (1) and (4) = 0.5 mm; remaining figures not to same scale.

round, opening laterally on paranotum at between 1/2 and 2/3 of paranotum length from anterior margin. Spiracles well-separated on diplosegments; both spiracles subcylindrical and protruding, with fine surface texture (not resolvable with optical microscopy). Sternites a little wider than long, not setose, transverse impressions deeper than longitudinal. Rounded-trapezoidal lamella between legs 4 on ring 5. Paired tufts of sparse setae between legs 5, paired tufts of shorter setae between legs 7. Legs slender, length at midbody ca 1.3x times ring height; relative podomere lengths at midbody femur >tarsus >prefemur >(postfemur, tibia). Anterior legs without setal brushes on tarsi; medial surface of leg 1 femur with very small, short, finger-like process. Preanal ring with only a few marginal setae. Epiproct (Fig. 3) with tip truncate, posterior and lateral setal papillae slightly produced; spinnerets in square array. Hypoproct trapezoidal.

Gonopods. Gonocoxa short, stout, tapering distally, setose anteriorly; emerging from aperture with anterior rim produced and thickened as rounded ridge. Telopodite (Figs 7, 8) straight, reaching base of leg 7 when retracted; base densely setose on posteromedial surface. Telopodite with constriction just distal to base on lateral surface, clearly separating setose prefemoral portion from bare acropodite. Acropodite expanded distally, divided at half telopodite height into short lateral tab and four processes, **a-d**. Process **a** arises from anteromedial surface; thin, sharply pointed, gently curved posteriorly. Process **b** arises from posteromedial surface; slightly wider than process **a** and sharply pointed; sinuous, curving first anteriorly, then posteriorly, then anteromedially to terminate at same height as process **a**. Process **c** arises more or less centrally on acropodite just distal to origins of **a** and **b**; expanded distally into laminate structure, the lamina tightly curved with medial concavity; distal margin broadly pointed anteriorly, notched laterally,



FIGS 7, 8. *Eungellosoma leichhardti* sp. nov., paratype ex QM S74954. Right gonopod telopodite, posterior and slightly medial (7) and lateral (8) views. Processes **a**-**d** labelled as in text; **sp** = sub-process of **c**, **t** = lateral tab. Process **a** not visible in lateral view; setae on base not shown. Dotted lines mark course of prostatic groove.

roughly triangular posteriorly, the anterior distal margin terminating at same height as processes **a** and **b**; a narrow, flattened, strap-like sub-process arising from the distal margin of process **c** on anterior side of lateral notch, directed posteriorly, then curving medially around anterior portion of laminate process **c** structure and extending distomedially, terminating in flattened, rounded apex distal and slightly medial to process **a** and **b** tips. Process **d** (= solenomere) arises medial to process **c** base; a little wider than process **a**, curving medially

between processes a and b, then laterally, then distally, the pointed apex cradled in the process c concavity. Lateral tab directed distolaterally, terminating at about 1/3 the height of process a, roundly pointed, the distal and anterior edges minutely toothed. Cannula prominent; prostatic groove running anterodistally on lateral surface of acropodite to base of lateral tab, looping posteriorly across base of tab, then running medially to enter base of process d, terminating at process d tip. With right and left telopodites in situ, the respective processes b and sub-processes of c cross at the midline.

Distribution and habitat. So far known only from tropical rainforest in Eungella National Park, Queensland (Fig. 11).

Remarks. This species was coded as 'genus QN, species QN1' in the 2006-07 sorting of Queensland Paradoxosomatidae (Mesibov 2008).

Binarcifer gen. nov.

Type species. *Binarcifer superbus* sp. nov., by present designation.

Etymology. Latin *binus* ('pair') + Latin *arcus* ('bow') + Latin *fero* ('bear'), masculine gender, referring to the paired, bow-like, lateral branches on the gonopod telopodite.

Diagnosis. Genus in Australiosomatinae: Australiosomatini with reduced but obvious paranota; gonopod acropodite divided at base above strong constriction into bifurcated lateral branch smoothly curving medially, and sickle-shaped, medially concave medial branch with short, basal, distomedially directed sub-branch; solenomere = posterior sub-branch of lateral branch.

Remarks. The deep division of the acropodite in *Binarcifer superbus* sp. nov. into medial and lateral branches, each further divided, is also seen in species of *Heterocladosoma* Jeekel, 1968 and *Hoplatessara* Verhoeff, 1928, and in all three genera the solenomere is the posterior-most of the sub-branches of the lateral branch. However, the shape and medial curvature of the medial branch in *B. superbus* sp. nov. is distinctive. In *Heterocladosoma* and *Hoplatessara* species the medial branch (or branches) is either straight or directed laterally near the apex.

Binarcifer superbus sp. nov.
(Figs 4-6, 9, 10)

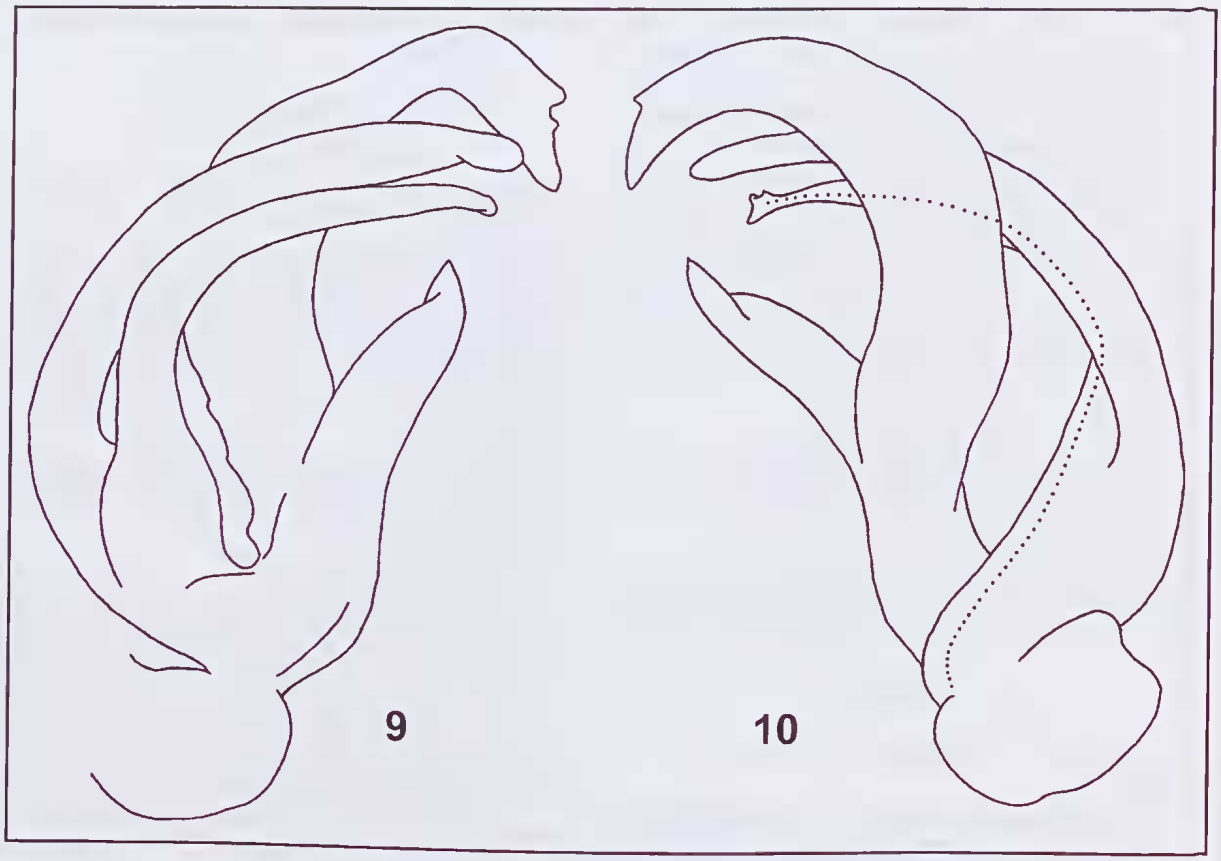
Etymology. Latin *superbus* ('excellent'), adjective; also a reference to the type locality.

Material Examined. Holotype: Male, Mt Superbus, Qld, 28°14'S 152°28'E, October 1990 - 24 April 1991, T.B. Churchill, pitfall, QM S75043. (According to advice from T.B. Churchill on 22 March 2013, her collecting site on Mt Superbus was the summit plateau, listed as 28°13'31"S 152°27'17"E in the QM Entomology database; ca 1320 m a.s.l., estimated uncertainty ±1 km.)

Paratype: Male, Mt Superbus, Qld, 2 August 1990, T.B. Churchill, night collecting, QM S33346. (Additional data as for holotype.)

Other material examined. None.

Description. *Somatic features.* Length ca 20 mm; midbody rings with maximum vertical diameter ca 1.7 mm, maximum width including paranota ca 2 mm. Holotype in alcohol patterned in pale yellow-brown and medium brown: lightest colour dorsally on collum and pro- and metazonites; light laterally on vertex, legs, epiproct and metazonites below paranota; dark around waist, laterally on prozonites, tips of legs and antennae; dark 'mask' around antennal sockets on frons and clypeus. Paratype bleached of colour. Head slightly wider than collum; vertex bare, frons and clypeus sparsely setose; vertigial sulcus clearly defined to level of top of antennal sockets; postantennal groove shallow; sockets separated by 1.2x socket diameter. Antenna reaching tergite 3 when stretched; antennomere 6 widest; relative antennomere lengths (2, 3, 6) >(4, 5). Collum in dorsal view with anterior margin convex and posterior margin very slightly emarginate; lateral margin short, almost straight, with slightly rounded anterior and posterior corners. Relative ring widths 6> 5>(collum 2, 3, 4); ring widths 6-16 about equal. Waist pronounced on diplosegments (Figs 4, 5), with faint longitudinal striations; suture inconspicuous; metazonite smooth, prozonite with very faint polygonal microsculpture. Tergites with distinct transverse furrow, not extending laterally as far as paranota. Pleural keels present as small



FIGS 9, 10. *Binarcifer superbus* sp. nov., paratype, QM S33346. Right gonopod telopodite, posterolateral (9) and anterior (10) views. Setae on base not shown. Dotted line marks course of prostatic groove.

bulge on ring 2, barely detectable swellings on rings 3, 4. Lateral margin of ring 2 paranotum well below lateral collum margin and ring 3 paranotum, with rectangular anterior and posterior corners. Distinct but much-reduced paranota on rings 3-18; in dorsal view (Fig. 4) with paranotal margin curving anteromedially, posterior end of paranotum not extending past posterior metatergal margin, dorsal sulcus barely detectable; paranotum at mid-height in lateral view (Fig. 5). Pore formula 5, 7, 9, 10, 12, 13, 15–19; ozopores round, opening laterally on paranotum at ca 3/4 of paranotum length from anterior margin. Spiracles well-separated on diplosegments; both spiracles slightly protruding, with fine sculpturing (not resolvable with optical microscopy). Sternites as wide as long, lightly setose; impressions very shallow, transverse impressions slightly deeper than longitudinal. Rounded-triangular lamella between legs 4 on ring 5. Legs slender, length at midbody ca 1.5x times ring height; relative podomere lengths at midbody tarsus >femur >(prefemur, tibia) >postfemur. Anterior legs without setal brushes on tarsi; medial surface of leg 1 femur with small, short, bluntly rounded process. Preanal ring with only a few marginal setae. Epiproct (Fig. 6) wide, roundly truncate, setal papillae not evident; spinnerets in square array. Hypoproct rounded-trapezoidal.

Gonopods. Gonocoxa short, stout, only slightly tapered distally, setose anteriorly; emerging from aperture with anterior rim not produced. Telopodite (Figs 9, 10) reaching base of leg 7 when retracted; base densely setose on posteromedial surface. Telopodite with strong constriction just distal to base, clearly separating setose prefemoral portion from bare acropodite.

Acropodite divided at base into two massive branches. Lateral branch smoothly curving medially and slightly posteriorly, terminating near body midline, divided at ca 1/4 acropodite height into cylindrical posterior and anterior sub-branches of approximately equal length. Posterior sub-branch (= solenomere) slightly tapered, flattening near tip with pointed, anteriorly directed apex; anterior sub-branch a little larger than posterior, paralleling posterior sub-branch and a little distal to it, terminating in bluntly rounded, slightly twisted apex. Main portion of medial branch of acropodite sickle-shaped, curving medially in transverse plane, anteroposteriorly flattened, twisting near apex to be dorsoventrally flattened, terminating just distal to lateral branch tips in expanded tip with small, rounded, marginal (medial) notch. A short, cylindrical sub-branch arising at ca 1/3 acropodite height on medial branch, directed distomedially, terminating near body midline in bluntly pointed, slightly twisted apex lying just basal and a little anterior to tips of lateral branch. Cannula prominent; prostatic groove running on medial surface of posterior sub-branch of lateral branch to pointed tip, without loop or other deviation.

Distribution and habitat. So far known only from subtropical rainforest on Mt Superbus in southeastern Queensland (Fig. 11).

Remarks. This species was coded as 'genus QTT, species QTT1' in the 2006-07 sorting of Queensland Paradoxosomatidae (Mesibov, 2008).

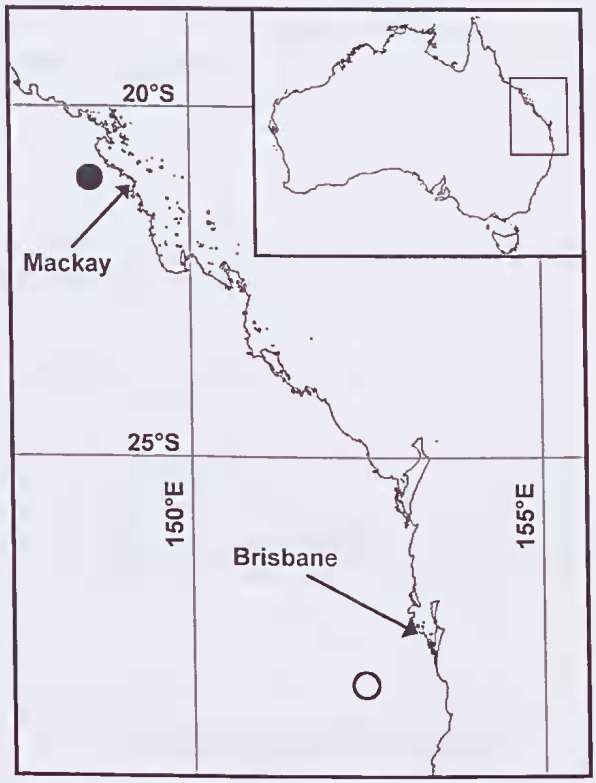


FIG. 11. Localities of *Eungellosoma leichhardti* sp. nov. (solid circle) and *Binarcifer superbus* sp. nov. (open circle). Inset shows location of main map. Geographic projection. The two localities are ca 890 km apart.

ACKNOWLEDGEMENTS

I thank Barbara Baehr (QM) for inviting me to contribute to the Leichhardt commemorative issue of the *Memoirs*; Tracey Churchill (Samford, Queensland) for information; Owen Seeman (QM) for the loan of specimens and for curatorial help in QM's wonderful millipede collection; and two anonymous referees for helpful comments on a draft of this paper. This study was funded by the author.

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